Claim 78, line 31, delete "the" (first occurrence).

Claim 78, line 34, delete "the" (first occurrence).

Claim 79, line 23, delete "the" (first occurrence).

Claim 79, line 25, delete "the" (first occurrence).

Claim 79, line 28, delete "the" (first occurrence)".

Claim 80, line 28, delete "the" (first occurrence).

Claim 80, line 30, delete "the" (first occurrence).

Claim 81, line 37, delete "the" (first occurrence).

Claim 81, line 39, delete "the" (first occurrence).

Claim 81, line 43, delete "the" (first occurrence).

REMARKS

Claims 1-81 are pending in this application.

Summary of Examiner's Action

The Examiner has rejected claims 2-25, 30, 36, 38, 39, 44, 53, 54, 56, 61-67, and 70-81 under 35 U.S.C. § 112, second paragraph, as allegedly being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as his invention.

In addition, the Examiner has rejected claims 1-6, 26-28, 30, 40, 56, 58 and 70-81 under 35 U.S.C. § 103 as allegedly being obvious over Bahler et al. United States Patent 4,425,612 (hereafter "Bahler et al.") in view of Easter United States Patent 4,641,229 (hereafter "Easter").

The Examiner also objected to claims 29, 31-35, 37, 39, 41-43, 45-52, 55, 57, 59, 60, 68 and 69, each of which depends from a claim rejected by the Examiner under 35 U.S.C. § 103.

Summary of Applicant's Response

The Examiner's rejections of claims 2-25 under 35 U.S.C. § 112, second paragraph, are respectfully traversed.

Applicant has amended claims 30, 36, 38, 44, 53, 56 and 70-81 to clarify the claim language and to more particularly point out and distinctly claim applicant's invention.

The Examiner's rejections of claims 1-6, 26-28, 30, 40, 56, 58 and 70-81 under 35 U.S.C. § 103 are respectfully traversed.

Applicant's Response To The Rejection Of Claims Under 35 U.S.C. § 112

Claims 2-25

The Examiner rejected claim 2 on the ground that the phrase "one of the [first or second] function terminals" [lines 24-25], used to define a connecting point for the "third means" recited in the claim, is incorrect because the third means allegedly can only be connected to the second function terminal. According to the Examiner, the third means cannot be connected to the first function terminal because claim 2 recites first means connected to the first function terminal.

Applicant believes that the phrase "one of the function terminals" is correct. Contrary to the position taken by the Examiner, the third means can be connected to the first function terminal along with the first means and, for example, is shown to be so connected in Figure 1 of the application. Figure 1 shows in this regard mode select circuitry 126 and error amplifier 118 both connected to terminal FB.

With respect to the Examiner's rejection of claims 3 and 5 on the ground that the phrase "the first reference signal" (line 5 of each claim) lacks antecedent basis, applicant believes that antecedent basis is provided by the phrase "a first reference signal" in the previous line of each claim.

For the above reasons, applicant respectfully submits that rejected claims 2, 3 and 5, and rejected claims 4 and 6-25 dependent therefrom, are allowable under 35 U.S.C. § 112, second paragraph.

Claims 30, 36, 38, 39, 44, 53, 54, 56, 61-67 and 70-81

The Examiner rejected claims 30, 36, 38, 44, 53, 56 and 70-81 under 35 U.S.C. § 112, second paragraph, as allegedly containing vague and indefinite terms, or terms lacking antecedent basis. Applicant has amended the claims in view of the Examiner's rejections to correct typographical errors and to more particularly define applicant's invention. Claim 30, line 3, and claim 44, line 3, have been amended to refer to "the first feedback signal." Claim 36, line 2, has been amended to correct a typographical error in the spelling of "include." Claims 38 and 53 have been amended by deleting the phrase "wherein the mode select signal is a current, and." Claims 38, 53, 56 and 70-81 have been amended to delete the term "the" before phrases which the Examiner asserted did not have antecedent basis. Applicant respectfully submits that these claims, as amended, and rejected claims 39, 54 and 61-67 dependent therefrom, are allowable under 35 U.S.C. § 112, second paragraph.

Applicant's Response To The Examiner's Rejections Under 35 U.S.C. § 103

The Examiner has rejected claims 1-6, 26-28, 30, 40, 56, 58 and 70-81 under 35 U.S.C. § 103 as allegedly being obvious over Bahler et al. in view of Easter. The Examiner has stated that Bahler et al. "discloses the integrated circuit essentially as claimed except for the feedforward signal being a second feedback signal from the output," and that "[i]t would have been obvious to one of ordinary skill in the art to use a second feedback signal from the output as taught by Easter for the

feedforward signal of Bahler et al. since in both Bahler et al. and Easter, the feed forward signal is used to control the duty cycle of the switching transistor." The Examiner's rejections under are respectfully traversed.

Bahler et al. and Easter, either alone or in combination, do not render obvious applicant's claimed invention. Bahler et al. relates to a switching regulator power supply that is adapted to receive a signal predicting subsequent changes in the load. The power supply uses the signal to adjust the duty cycle of the power supply switch in anticipation of the change in load. The supply thus requires a priori knowledge of changes in the load to regulate the duty cycle under transient load conditions. The block diagram for the power supply shows a switching transistor 12 connected to the primary of a transformer 13, the secondary of which is connected in a flyback configuration including rectification diode 14 and filter capacitor 15. Also shown is a controller 8 which operates in a "conventional" mode during steady state conditions and in a "transient anticipation" mode just before and during load changes. In the "conventional" mode, controller 8 controls the duty cycle of switching transistor 12 in response to a feedback voltage (vfb) from the output Vo of the power supply and a feedforward signal (vff) from the secondary of a transformer 18 whose primary is connected to an AC input. In the "transient anticipation" mode, controller 8 controls the duty cycle of switching transistor 12 in response to a pair of digital signals generated by a digital control circuit 3, which monitors the data bus 2 of a load device 1 for information indicative of future load changes.

Easter relates to a switching dc-to-dc voltage converter in which directly-transformed and flyback-transformed output currents are respectively integrated by first and second

output capacitors having a capacitance ratio which is in accordance with the ratio of energy supplied by the capacitors to a load. The converter output voltage or a portion thereof provides a feedback signal which is compared to a voltage standard to control the relative durations of directly-transformed and flyback-transformed current flow.

Claims 1-6, 26-28, 30, 40, 56, 58, 70-72, 74-78 and 80-81, describe a switching voltage regulator operable in a normal feedback mode and an isolated flyback mode. The isolated flyback mode of applicant's claimed voltage regulator allows a transformer secondary winding connected to the regulator output circuit to be electrically isolated from the input circuit connected to the primary winding. Regulation of output voltage supplied to the load is accomplished by regulating the peak flyback voltage developed across the primary winding of the transformer when the secondary winding provides current to the output circuit.

The cited references do not describe the combination of a normal feedback vollage regulator and an isolated flyback voltage regulator as claimed. Neither of the cited references discloses an isolated flyback voltage regulator making use of a flyback voltage developed across the primary winding of a transformer as a feedback signal to control the duty cycle of a switching transistor. Instead, Bahler et al. discloses a supply circuit that relies on a priori knowledge of changes in the load and on a feedback signal (vfb) from the circuitry connected to the secondary winding of the output transformer to control the duty cycle of a switching transistor. Bahler does not even recognize that a flyback voltage develops across the primary winding of the transformer.

Easter does not overcome this deficiency. The flyback circuits disclosed in Easter also rely on a feedback signal derived from circuitry connected to the secondary winding of the transformer. Furthermore, Easter teaches away from the unique feedback mechanism of applicant's isolated flyback mode by teaching that "[a]s is customary, the flyback voltage across [a primary winding] owing to its self-inductance is snubbed by a snubber circuit SN ... to avoid damaging of the converter input circuitry." See Easter column 3, lines 1-5.

Nor do Bahler et al. or Easter suggest applicant's invention. Bahler et al. and Easter cannot be operated in an isolated flyback mode due to a lack of isolation between the regulator output circuit connected to the transformer secondary winding and the input circuit connected to the primary winding. The circuits taught by the references all require feedback mechanisms in which a feedback signal is supplied by the regulator output circuit to the input circuit, thereby precluding isolation. To the contrary, applicant claims a unique voltage regulator circuit which is capable of operating in an isolated flyback mode because the circuit does not require a feedback signal from the regulator output circuit. Applicant's claimed invention thus is not made obvious by the flyback circuits disclosed in the cited references.

The cited references, alone or in combination, also do not teach or suggest an integrated circuit switching voltage regulator having one or more multi-function terminals, as claimed by applicant in claims 70-81, including at least a first multi-function terminal responsive to control signals applied thereto for performing: (a) controlling the duty cycle of the switching transistor when the integrated circuit is operating in a normal feedback mode, (b) programming the integrated circuit to operate in one of a normal feedback mode and a fully-isolated flyback

mode, or (c) trimming a flyback voltage developed across a winding of an external transformer when the integrated circuit operates in a fully-isolated flyback mode; or a second multi-function terminal responsive to control signals applied thereto for performing: (a) frequency compensating the integrated circuit, (b) limiting peak current conducted by the switching transistor, (c) variably limiting current conducted by the switching transistor as a function of time, or (d) shutting down the integrated circuit, whereby current drawn by the integrated circuit is reduced.

The architecture and arrangement of applicant's circuit, which allows it to be implemented as an integrated circuit, including drive circuitry, a switching transistor and control circuitry for controlling the on and off duty cycle of the switching transistor, and having as few as five terminals for connection to external components for performing the several claimed functions, is unique. The Examiner's statement that "the specific control circuitry" of applicant's integrated circuit is made obvious because "the Bahler et al. patent discloses in col. 3, last paragraph, that any of a variety of forms known to the prior art may be used," is respectfully traversed. The cited references, alone or in combination, simply do not disclose or suggest applicant's claimed integrated circuit switching voltage regulator which includes drive, switching and control circuitry in a five-terminal integrated circuit.

Applicant's claimed circuit provides features, and a versatility, that none of the references show or suggest. Applicant has accomplished with an elegant and nonobvious invention what the references do, and can, not. The integrated circuit claimed by applicant is compact and can be utilized in a

wide variety of regulator circuit topologies, and its claimed features make the invention particularly attractive to regulator circuit designers.

Conclusion

For the foregoing reasons, it is respectfully submitted that claims 1-81, including amended claims 30, 36, 38, 44, 53, 56 and 70-81, are patentable under 35 U.S.C. § 112, second paragraph, and are patentable over the cited references. Accordingly, reconsideration and prompt allowance of this application are respectfully requested.

Respectfully submitted,

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I Hereby Certify that this Correspondence is being Deposited with the U. S. Postal Service as First Class Mail in an Envelope Addressed to: Commissioner of Patents and Trademarks, Washington, D.C. 20231, on August 19, 1988

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Name of Person Signing

Carol L. Scott
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